



(19) Japanese Patent Office (JP)

(12) Japanese Unexamined Patent Publication (A)

(11) Publication of patent application

Sho-63-37954

(43) Laid-open on: February 18, 1988

(51)

Int.Cl. ⁴ B41J 3/04	Identification No. 102	Domestic file No. 8302-2C
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Examination request: Not requested

Number of invention: 1 (5 pages in all)

(54) Title of the invention: Liquid jet recording device

(21) Application No. Sho-61-180158

(22) Filed on: August 1, 1986

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SPECIFICATION

1. TITLE OF THE INVENTION

LIQUID JET RECORDING DEVICE

2. WHAT IS CLAIMED IS:

A liquid jet recording device, equipping a plurality of recording liquid tanks, which contain different types of recording liquids in a classified manner and are enabled to be replenished with the respective recording liquids by means of replenishing liquid tanks, and carrying out recording by the different types of recording liquids,

the liquid jet recording device wherein the recording liquid tanks are provided with replenishing ports for the replenishing of the recording liquids and the shapes of coupling portions of the replenishing ports are made different in accordance to the types of the recording liquids so that, to each of the coupling portions of the replenishing ports that are made different in shape, only a coupling portion of a recording liquid supplying port of a replenishing liquid tank corresponding to that replenishing port can be coupled.

3. DETAILED DESCRIPTION OF THE INVENTION

[Field of the Invention]

This invention concerns a liquid jet recording device, and to be more specific, concerns a liquid jet recording device that is equipped with liquid tanks, which respectively store a plurality of types of recording liquids in a replenishable

manner, and is enabled to perform multi-color recording.

[Prior Arts]

Among the various conventionally known recording devices, so-called ink jet recording devices, which enable high-speed recording by a non-impact recording method, whereby hardly any noise is generated during recording, and enable recording without requiring a special fixing process on normal paper, are recognized as being extremely useful means of recording. With such liquid jet recording devices, various systems have been proposed, and while some have been made available commercially upon being improved, with others, efforts towards practical use are being continued currently.

Ink jet recording devices perform recording by discharging and jetting out droplets of ink and making these droplets become deposited on paper or other recording material, and are classified largely into several systems according to the ink droplet generating means, the control means, for controlling the direction of flight of the generated ink droplets, etc.

Representative systems among these include, for example, the Sweet system, disclosed in USP (United States Patent) No. 3596275, the Lewis and Brown system, disclosed in USP No. 3298030, etc. With these systems, an ink droplet flow of controlled charge amount is generated by a continuous oscillation method and by causing this ink droplet flow to fly by means of deflection

electrodes, to which a uniform electric field is applied, recording onto paper or other recording material is performed while controlling the flight path of the liquid droplets. Such a system is generally called a continuous system for short.

As an example of another representative system that is contrasted with the above system, there is the Stemme method, which, for example, is disclosed in USP (United States Patent) No. 3747120. With this system, electrical recording signals are applied to a piezo-vibration element that is provided in a recording head, equipping an orifice that discharges ink, the electrical recording signals are converted to mechanical vibrations by the piezo-vibration element, and ink droplets are discharged from the orifice as required in accordance to the mechanical vibration and thereby made to fly and become deposited on a recording material to perform recording. Such a system is generally called an on-demand system.

Furthermore, color recording, using the liquid jet recording devices described above, have come to be carried out recently, and with a device for this purpose, dedicated recording heads and recording liquid tanks are provided according to different colors. However, due to differing in chemical component and physical characteristics according to color, such recording liquids not only change in color when mixed but, in many cases, also incur serious damage to a device due to changes in characteristics.

In regard to the replenishing of a recording liquid, the possibility of supplying a recording liquid of different color erroneously increases as the number of colors of recording liquids that are used increases as in recent times. However, a means for preventing errors in replenishment have not been provided as of presently.

[Problems to be Solved by the Invention]

In view of the above issue, an object of this invention is to resolve the above issue by providing a liquid jet recording device, with which erroneous supplying of recording liquids will not occur.

[Means for Solving the Problem]

In order to achieve the above object, this invention provides in a liquid jet recording device, equipping a plurality of recording liquid tanks, which contain different types of recording liquids in a classified manner and are enabled to be replenished with the respective recording liquids by means of replenishing liquid tanks, and carrying out recording by the different types of recording liquids, a liquid jet recording device characterized in that the recording liquid tanks are provided with replenishing ports for the replenishing of the recording liquids and the shapes of coupling portions of the replenishing ports are made different in accordance to the types of the above-mentioned recording liquids so that, to each of the coupling portions of the replenishing ports that are made

different in shape, only a coupling portion of a recording liquid supplying port of a replenishing liquid tank corresponding to that replenishing port can be coupled.

[Actions]

With this invention's liquid jet recording device, since the recording liquid-replenishing ports of the plurality of recording liquid tanks are respectively provided with coupling portions of different shapes and the supplying port of each individual replenishing liquid tank is provided with a coupling portion of a shape corresponding to a certain coupling portion, even when the supplying of a recording liquid of a different type of color is attempted erroneously, insertion will not be allowed due to the shapes of the above-described coupling portions being unmatched. Mixing of liquids due to erroneous operation can thus be prevented.

[Embodiments]

An embodiment of this invention shall now be described based on the drawings.

FIG. 1 shows an embodiment of this invention. Here, 1 is a recording material, which is wound in the form of a roll, 2 is a drive roller, which delivers recording material 1 to a recording position, 3 is a platen, which is positioned along the recording position and is enabled to hold recording material 1 at the recording position by sucking in air, and 4 is a cutter, enabled to cut recording material 1 at an arbitrary length.

5, 6, 7, and 8 are recording heads, positioned along platen 3, and in the present embodiment, recording liquids of different colors are discharged from these four recording heads. 9, 10, 11, and 12 are recording liquid tanks, which respectively contain the recording liquids corresponding to recording heads 5, 6, 7, and 8, and 13A to 13D are supply tubes, which supply liquids from recording liquid tanks 9 to 12 to recording heads 5 to 8.

Also with the present embodiment, by disposing the above-mentioned recording liquid tanks 9 to 12 in a layered, stairs-like manner, recording liquid replenishing ports 9A to 12A, respectively corresponding to the individual grooves 9 through 12, are positioned on upper surfaces that exposed by displacements provided in the vertical direction, and caps 9B to 12B are fitted onto the respective replenishing ports 9A to 12A. With the present embodiment, the planar positions of replenishing ports 9A to 12A are also displaced as shown in FIG. 2 so that mutual interference will not occur in the replenishing of the liquids.

Furthermore, 20 indicates injection ports of replenishing portions 9A to 12A, 9C to 12C indicate insertion grooves, which are respectively formed to special shapes at the peripheries of the individual injection ports 20, and with the present embodiment, insertion groove 9C of replenishing port 9A is made oval, insertion groove 10C of replenishing port

10A is made triangular, insertion groove 11C of replenishing port 11A is made circular, and insertion groove 12C of replenishing port 12A is made rectangular.

In regard to such recording liquid tanks 9 to 12, the replenishing of a recording liquid, for example, into recording liquid tank 12 shall now be described with reference to FIG. 3. Here, the cap of tank 12 has been removed already, and 30 indicates a replenishing liquid tank for replenishing recording liquid 12K, corresponding to recording liquid tank 12.

On replenishing liquid tank 30, an insertion portion 30C, which has a shape corresponding to insertion groove 12c of recording liquid tank 12, that is, an outer peripheral portion with an oval shape in the case of the present embodiment, is formed as a peripheral portion of a supplying port 31 thereof, and in the replenishing process, replenishing is enabled only after injection port 20 of replenishing port 12A of the tank 12 side is inserted into supplying port 31 and insertion portion 30C of the tank 30 side is fitted into insertion groove 12C of replenishing port 12A.

32 indicates a sealing member, provided at supplying port 31 of replenishing liquid tank 30, and 12D is an air hole, bored in a top portion of recording liquid tank 12.

Though, besides enabling multicolor recording, the operations of the liquid jet recording device arranged in the above manner does not differ in particular from those of other

liquid jet recording devices, and recording is carried out by recording liquids of different colors being discharged in order by recording heads 5 to 8 at the position of platen 3 onto recording material 1, fed by drive roller 2, at time intervals corresponding to the delay time of sheet feeding between heads. When any of recording liquid tanks 9 through 12 needs to be replenished, the corresponding cap is removed, a replenishing liquid tank is inverted and its insertion portion is set in the insertion groove of the replenishing port as shown in FIG. 3, and since replenishing upon piercing of seal member 32 is enabled only when the components match, a replenishing liquid of a different color will not be injected into the intended recording liquid tank.

Though with the example described above, a case where the recording liquid tanks are set horizontally on their sides and layered was described, the application of this invention is not limited thereto, and needless to say, this invention can be applied regardless of the form of positioning of the recording liquid tanks and the means of connection with respect to the replenishing liquid tanks.

[Effects of the Invention]

As described above, with the present invention, since the shapes of the individual replenishing port coupling portions provided on the recording liquid tanks are differed according to the types of recording liquids, and each of the replenishing

recording liquid tanks, for supplying recording liquids according to type via the replenishing port coupling portions that have been made different in shape, is provided with a supplying port having a coupling portion that can be fitted to the corresponding replenishing port, the attachment of a replenishing recording liquid tank, filled with a recording liquid of a type that differs from an intended recording liquid, to the intended recording liquid tank in the process of replenishing a recording liquid is made impossible and the mixing of different types of recording liquids is thus prevented.

4. BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a line diagram schematically illustrating an example of the arrangement of this invention's liquid jet recording device, FIG. 2 is a top view of a plurality of recording liquid tanks of the same, and FIG. 3 is an explanatory diagram showing, in section, a state of supplying a recording liquid from a replenishing liquid tank to one of the recording liquid tanks of the same.

5, 6, 7, 8 . . . recording head

9, 10, 11, 12 . . . recording liquid tank

9A, 10A, 11A, 12A . . . replenishing port

9C, 10C, 11C, 12C . . . insertion groove

12K . . . recording liquid

20 . . . injection port

30 . . . replenishing liquid tank

31 . . . supplying port

30C . . . insertion portion

FIG. 1

View on arrow A

1 Recording material

3 Platen

5 Recording head

6 Recording head

7 Recording head

8 Recording head

9 Recording liquid tank

12 Recording liquid tank

FIG. 2

9 Recording liquid tank

9A Replenishing port

9C Insertion groove

12 Recording liquid tank

10C Insertion groove

11C Insertion groove

12 Recording liquid tank

12A Replenishing port

12C Insertion groove

20 Injection port

FIG. 3

12 Recording liquid tank

12D Air hole

30 Replenishing liquid tank

30C Insertion portion